

1 **WHAT IS CLAIMED IS:**

2 1. A water-soluble and non-water-soluble materials separation device  
3 comprising:  
4 a tank with multiple stirring zones, multiple precipitation zones alternately  
5 arranged with the stirring zones, an outlet defined in a top portion of the tank, an inlet  
6 defined adjacent to the outlet and a water inlet defined in a bottom portion of the tank;  
7 and

8 a collecting tank engaged with and communicating the tank, wherein each  
9 precipitation zone has multiple extraction pipes and each stirring zone has stirring  
10 blades,  
11 whereby solution containing therein water-soluble and non-water-soluble  
12 materials is able to be added into the tank and mixed with water, which is added from the  
13 water inlet and flows from a bottom to a top in the tank, in the stirring zones so as to  
14 repeatedly allow formation of precipitation in the precipitation zones and collection of  
15 the precipitation in the collection tank.

16 2. The separation device as claimed in claim 1, wherein the collection tank is  
17 conical.

18 3. The separation device as claimed in claim 2, wherein the tank is sequentially  
19 divided into a top precipitation zone, a primary stirring zone, a primary precipitation  
20 zone, a secondary stirring zone, a bottom precipitation zone and a concentration zone,  
21 wherein the concentration zone is defined in the collection tank.

22 4. The separation device as claimed in claim 1, wherein the tank is sequentially  
23 divided into a top precipitation zone, a primary stirring zone, a primary precipitation  
24 zone, a secondary stirring zone, a bottom precipitation zone and a concentration zone,

1 wherein the concentration zone is defined in the collection tank.

2 5. The separation device as claimed in claim 3, wherein the top precipitation  
3 zone has multiple extraction pipes.

4 6. The separation device as claimed in claim 5, wherein each extraction pipe has  
5 a diameter and a length 5-20 times larger than the diameter.

6 7. The separation device as claimed in claim 5, wherein the extraction pipes are  
7 inclined for 10 to 20 degrees relative to water level.

8 8. The separation device as claimed in claim 3, wherein the outlet is defined in  
9 the top precipitation zone at a side face of the tank.

10 9. The separation device as claimed in claim 3, wherein the inlet is defined in the  
11 primary stirring zone.

12 10. The separation device as claimed in claim 3, wherein the primary  
13 precipitation zone has multiple second extraction pipes,

14 wherein each second extraction pipe has a diameter and a length 20 to 200 times  
15 larger than the diameter.

16 11. The separation device as claimed in claim 10, wherein the second extraction  
17 pipes are vertical with respect to water level.

18 12. The separation device as claimed in claim 3, wherein the water inlet is  
19 defined in the secondary stirring zone.

20 13. The separation device as claimed in claim 3, wherein the bottom  
21 precipitation zone has multiple third extraction pipes,

22 wherein each third extraction pipe has a diameter and a length 5 to 20 times  
23 larger than the diameter.

24 14. The separation device as claimed in claim 3, wherein the collection tank has

1 a bottom outlet for collecting precipitation.

2 15. The separation device as claimed in claim 3, wherein the secondary stirring  
3 zone has second stirring blades provided therein and the tank has a motor mounted on a  
4 top thereof and an axle extending from the motor to drive the stirring blades and the  
5 second blades.

6 16. The separation device as claimed in claim 3, wherein a baffle is provided  
7 between the top precipitation zone and primary stirring zone, the primary stirring zone  
8 and the primary precipitation zone, the primary precipitation zone and the secondary  
9 stirring zone and between the secondary stirring zone and the bottom precipitation zone,  
10 wherein each baffle is secured to an inner face of the tank by a positioning plate  
11 which is securely engaged with the inner face of the tank, and each baffle has a central  
12 opening aligned with each other and a tapered periphery formed on a periphery defining  
13 the central opening,

14 wherein an annular gap is defined between a distal edge of the baffle and the  
15 inner face of the tank.

16 17. The separation device as claimed in claim 16, wherein multiple guiding  
17 plates are securely provided on the inner face of the tank to guide solution flow toward a  
18 center of the baffle,

19 wherein the positioning plate to position the baffle between the top precipitation  
20 zone and the primary stirring zone is below the baffle and secured to the inner face of the  
21 tank.

22 18. The separation device as claimed in claim 17, wherein the guiding plate is  
23 spatially \*parted from the baffle between the top precipitation zone and the primary  
24 stirring zone and is on top of the baffle,

1 the positioning plate to position the baffle between the primary stirring zone and  
2 the primary precipitation zone is on top of the baffle and secured to the inner face of the  
3 tank.

4 19. The separation device as claimed in claim 18, the guiding plate is spatially  
5 apart from the baffle between the primary stirring zone and the primary precipitation  
6 zone and is below the baffle.

7 20. The separation device as claimed in claim 19, wherein the guiding plate has  
8 a width larger than a width of the annular gap.